

## PHASE CONTROL THYRISTORS

## Hockey Puk Version

### Features

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case A-24 (K-PUK)
- High profile hockey-puk

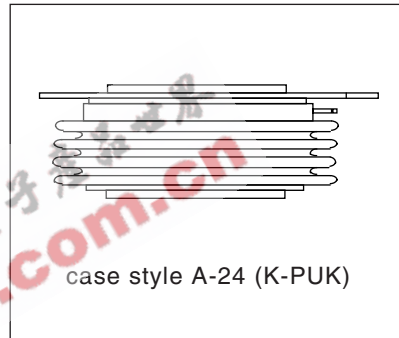
### Typical Applications

- DC motor controls
- Controlled DC power supplies
- AC controllers

### Major Ratings and Characteristics

| Parameters        | ST1200C..K    | Units             |
|-------------------|---------------|-------------------|
| $I_{T(AV)}$       | 1650          | A                 |
|                   | @ $T_{hs}$ 55 | °C                |
| $I_{T(RMS)}$      | 3080          | A                 |
|                   | @ $T_{hs}$ 25 | °C                |
| $I_{TSM}$         | @ 50Hz 30500  | A                 |
|                   | @ 60Hz 32000  | A                 |
| $I^2t$            | @ 50Hz 4651   | KA <sup>2</sup> s |
|                   | @ 60Hz 4250   | KA <sup>2</sup> s |
| $V_{DRM}/V_{RRM}$ | 1200 to 2000  | V                 |
| $t_q$ typical     | 200           | μs                |
| $T_J$             | - 40 to 125   | °C                |

1650A



## ST1200C..K Series

Bulletin I25196 rev.B 01/00

International  
IRF Rectifier

### ELECTRICAL SPECIFICATIONS

#### Voltage Ratings

| Type number | Voltage Code | $V_{DRM}/V_{RRM}$ , max. repetitive peak and off-state voltage<br>V | $V_{RSM}$ , maximum non-repetitive peak voltage<br>V | $I_{DRM}/I_{RRM}$ max.<br>@ $T_J = T_J$ max<br>mA |
|-------------|--------------|---|--|---|
| ST1200C..K  | 12           | 1200  | 1300   | 100   |
|             | 14           | 1400  | 1500   |   |
|             | 16           | 1600  | 1700   |   |
|             | 18           | 1800  | 1900   |   |
|             | 20           | 2000  | 2100   |   |

#### On-state Conduction

| Parameter  | ST1200C..K | Units              | Conditions   |                       |
|--|------------|--------------------|--|-----------------------|
| $I_{T(AV)}$ Max. average on-state current @ Heatsink temperature | 1650 (700) | A                  | 180° conduction, half sine wave double side (single side) cooled                     |                       |
|  | 55 (85)    | °C                 |  |                       |
| $I_{T(RMS)}$ Max. RMS on-state current                           | 3080       | A                  | DC @ 25°C heatsink temperature double side cooled                                    |                       |
| $I_{TSM}$ Max. peak, one-cycle non-repetitive surge current      | 30500      |                    | t = 10ms   | No voltage reappplied |
|  | 32000      |                    | t = 8.3ms  | reappplied            |
|  | 25700      |                    | t = 10ms   | 100% $V_{RRM}$        |
|  | 26900      |                    | t = 8.3ms  | reappplied            |
| $I^2t$ Maximum $I^2t$ for fusing                                 | 4651       | KA <sup>2</sup> s  | t = 10ms   | No voltage reappplied |
|  | 4250       |                    | t = 8.3ms  | reappplied            |
|  | 3300       |                    | t = 10ms   | 100% $V_{RRM}$        |
|  | 3000       |                    | t = 8.3ms  | reappplied            |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing                   | 46510      | KA <sup>2</sup> /s | t = 0.1 to 10ms, no voltage reappplied   |                       |
| $V_{T(TO)1}$ Low level value of threshold voltage                | 0.91       | V                  | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$ , $T_J = T_J$ max. |                       |
| $V_{T(TO)2}$ High level value of threshold voltage               | 1.01       |                    | $(I > \pi \times I_{T(AV)})$ , $T_J = T_J$ max.                                      |                       |
| $r_{t1}$ Low level value of on-state slope resistance            | 0.21       | mΩ                 | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$ , $T_J = T_J$ max. |                       |
| $r_{t2}$ High level value of on-state slope resistance           | 0.19       |                    | $(I > \pi \times I_{T(AV)})$ , $T_J = T_J$ max.                                      |                       |
| $V_{TM}$ Max. on-state voltage                                   | 1.73       | V                  | $I_{pk} = 4000A$ , $T_J = T_J$ max, $t_p = 10ms$ sine pulse                          |                       |
| $I_H$ Maximum holding current                                    | 600        | mA                 | $T_J = 25^\circ C$ , anode supply 12V resistive load                                 |                       |
| $I_L$ Typical latching current                                   | 1000       |                    |  |                       |

Switching

| Parameter   | ST1200C..K | Units | Conditions  |
|---|------------|-------|---|
| di/dt Max. non-repetitive rate of rise of turned-on current | 1000       | A/μs  | Gate drive 20V, 20Ω, $t_r \leq 1\mu s$<br>$T_J = T_J \text{ max}$ , anode voltage $\leq 80\% V_{DRM}$                                   |
| $t_d$ Typical delay time                                    | 1.9        | μs    | Gate current 1A, $d_i/d_t = 1A/\mu s$<br>$V_d = 0.67\% V_{DRM}$ , $T_J = 25^\circ C$  |
| $t_q$ Typical turn-off time                                 | 200        |       | $I_{TM} = 550A$ , $T_J = T_J \text{ max}$ , $d_i/d_t = 40A/\mu s$ , $V_R = 50V$<br>$dv/dt = 20V/\mu s$ , Gate 0V 100Ω, $t_p = 500\mu s$ |

Blocking

| Parameter  | ST1200C..K | Units | Conditions  |
|--|------------|-------|---|
| dv/dt Maximum critical rate of rise of off-state voltage               | 500        | V/μs  | $T_J = T_J \text{ max}$ . linear to 80% rated $V_{DRM}$   |
| $I_{RRM}$<br>$I_{DRM}$ Max. peak reverse and off-state leakage current | 100        | mA    | $T_J = T_J \text{ max}$ , rated $V_{DRM}/V_{RRM}$ applied |

Triggering

| Parameter                                    | ST1200C..K |      | Units | Conditions  |
|--|------------|------|-------|---|
| $P_{GM}$ Maximum peak gate power             | 16         |      | W     | $T_J = T_J \text{ max}$ , $t_p \leq 5ms$  |
| $P_{G(AV)}$ Maximum average gate power       | 3          |      |       |   |
| $I_{GM}$ Max. peak positive gate current     | 3.0        |      | A     | $T_J = T_J \text{ max}$ , $t_p \leq 5ms$  |
| $+V_{GM}$ Maximum peak positive gate voltage | 20         |      | V     | $T_J = T_J \text{ max}$ , $t_p \leq 5ms$  |
| $-V_{GM}$ Maximum peak negative gate voltage | 5.0        |      |       |   |
| $I_{GT}$ DC gate current required to trigger | TYP.       | MAX. | mA    | $T_J = -40^\circ C$<br>$T_J = 25^\circ C$<br>$T_J = 125^\circ C$<br>Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied |
|  | 200        | -    |       |   |
|  | 100        | 200  |       |   |
| $V_{GT}$ DC gate voltage required to trigger | 1.4        | -    | V     | $T_J = -40^\circ C$<br>$T_J = 25^\circ C$<br>$T_J = 125^\circ C$  |
|  | 1.1        | 3.0  |       |   |
|  | 0.9        | -    |       |   |
| $I_{GD}$ DC gate current not to trigger      | 10         |      | mA    | Max. gate current/voltage not to trigger is the max. value which will not trigger any unit with rated $V_{DRM}$ anode-to-cathode applied  |
| $V_{GD}$ DC gate voltage not to trigger      | 0.25       |      | V     |   |

## ST1200C..K Series

Bulletin I25196 rev.B 01/00

International  
IRF Rectifier

### Thermal and Mechanical Specification

| Parameter   | ST1200C..K      | Units     | Conditions   |
|---|-----------------|-----------|--|
| T <sub>J</sub> Max. operating temperature range                   | -40 to 125      | °C        |  |
| T <sub>stg</sub> Max. storage temperature range                   | -40 to 150      |           |  |
| R <sub>thJ-hs</sub> Max. thermal resistance, junction to heatsink | 0.042<br>0.021  | K/W       | DC operation single side cooled<br>DC operation double side cooled |
| R <sub>thC-hs</sub> Max. thermal resistance, case to heatsink     | 0.006<br>0.003  | K/W       | DC operation single side cooled<br>DC operation double side cooled |
| F Mounting force, ± 10%   | 24500<br>(2500) | N<br>(Kg) |  |
| wt Approximate weight   | 425             | g         |  |
| Case style  | A-24 (K-PUK)    |           | See Outline Table  |

### $\Delta R_{thJ-hs}$ Conduction

(The following table shows the increment of thermal resistance R<sub>thJ-hs</sub> when devices operate at different conduction angles than DC)

| Conduction angle | Sinusoidal conduction |             | Rectangular conduction |             | Units | Conditions                           |
|------------------|-----------------------|-------------|------------------------|-------------|-------|--------------------------------------|
|                  | Single Side           | Double Side | Single Side            | Double Side |       |                                      |
| 180°             | 0.003                 | 0.003       | 0.002                  | 0.002       | K/W   | T <sub>J</sub> = T <sub>J</sub> max. |
| 120°             | 0.004                 | 0.004       | 0.004                  | 0.004       |       |                                      |
| 90°              | 0.005                 | 0.005       | 0.005                  | 0.005       |       |                                      |
| 60°              | 0.007                 | 0.007       | 0.007                  | 0.007       |       |                                      |
| 30°              | 0.012                 | 0.012       | 0.012                  | 0.012       |       |                                      |

### Ordering Information Table

| Device Code |     |  |   |    |   |   |   |
|-------------|-----|--|---|----|---|---|---|
| 1           | 2   | 3  | 4 | 5  | 6 | 7 | 8 |
| ST          | 120 | 0  | C | 20 | K | 1 |   |
| <b>1</b>    | -   | Thyristor  |   |    |   |   |   |
| <b>2</b>    | -   | Essential part number  |   |    |   |   |   |
| <b>3</b>    | -   | 0 = Converter grade  |   |    |   |   |   |
| <b>4</b>    | -   | C = Ceramic Puk  |   |    |   |   |   |
| <b>5</b>    | -   | Voltage code: Code x 100 = V <sub>RRM</sub> (See Voltage Rating Table) |   |    |   |   |   |
| <b>6</b>    | -   | K = Puk Case A-24 (K-PUK)  |   |    |   |   |   |
| <b>7</b>    | -   | 0 = Eyelet terminals (Gate and Auxiliary Cathode Unsoldered Leads)     |   |    |   |   |   |
|             |     | 1 = Fast-on terminals (Gate and Auxiliary Cathode Unsoldered Leads)    |   |    |   |   |   |
|             |     | 2 = Eyelet terminals (Gate and Auxiliary Cathode Soldered Leads)       |   |    |   |   |   |
|             |     | 3 = Fast-on terminals (Gate and Auxiliary Cathode Soldered Leads)      |   |    |   |   |   |
| <b>8</b>    | -   | Critical dv/dt: None = 500V/μsec (Standard selection)                  |   |    |   |   |   |
|             |     | L = 1000V/μsec (Special selection)                                     |   |    |   |   |   |

Outline Table

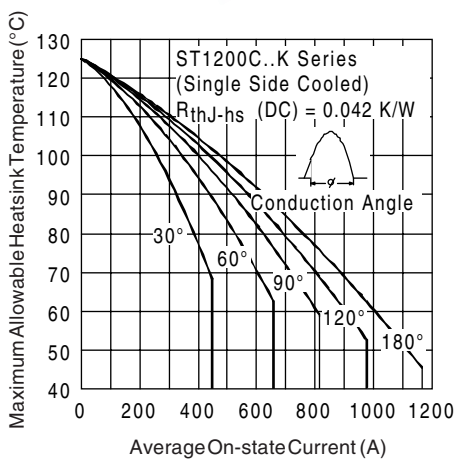
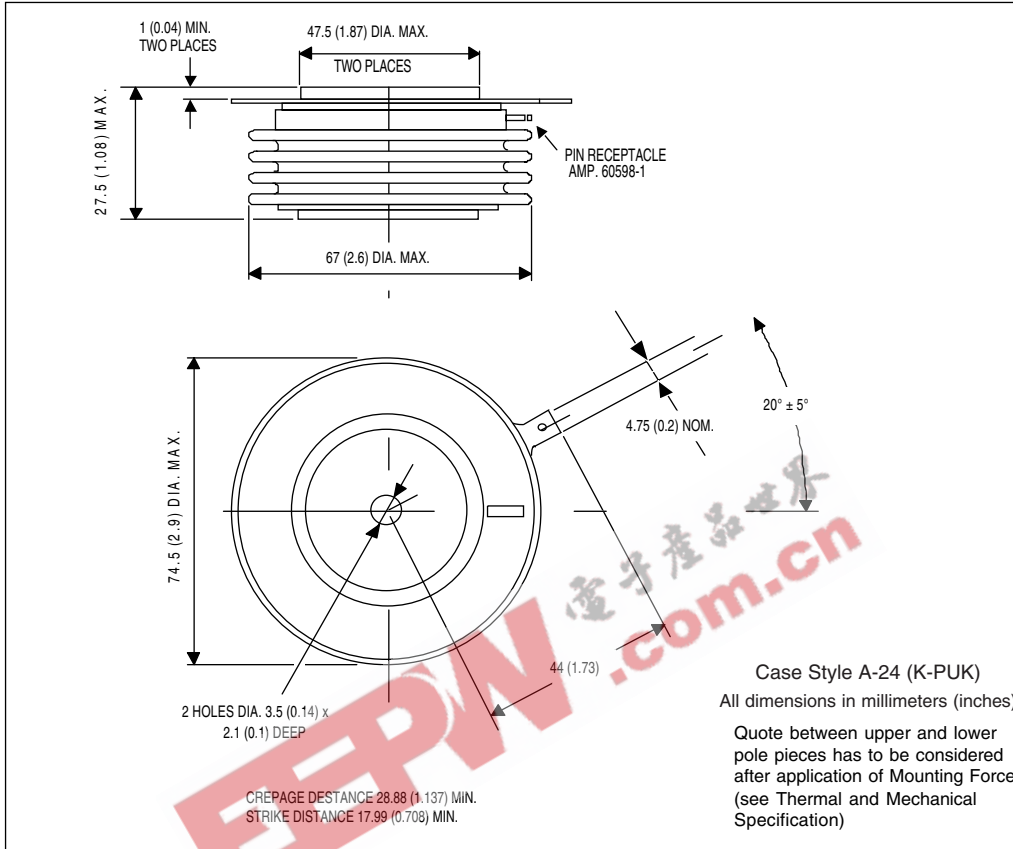


Fig. 1 - Current Ratings Characteristics

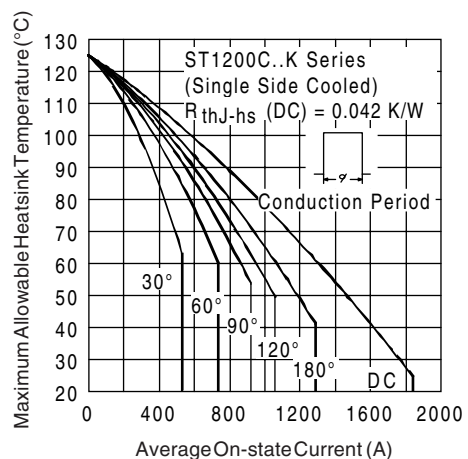


Fig. 2 - Current Ratings Characteristics

# ST1200C..K Series

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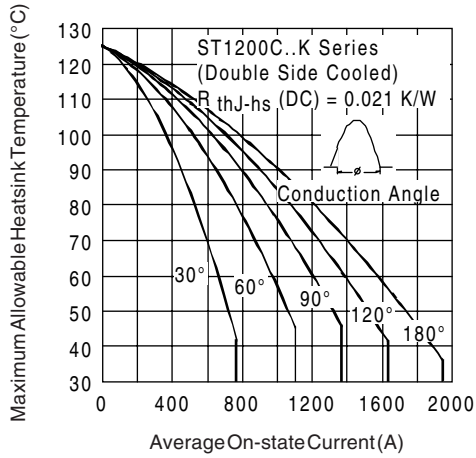


Fig. 3 - Current Ratings Characteristics

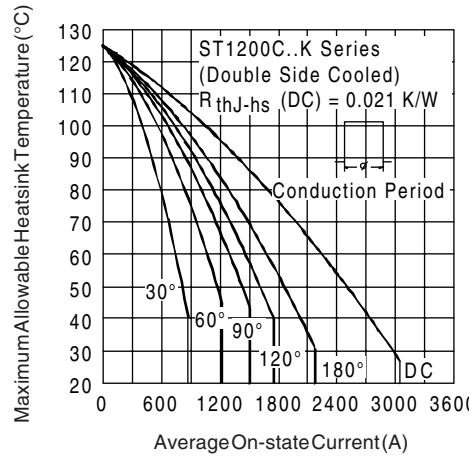


Fig. 4 - Current Ratings Characteristics

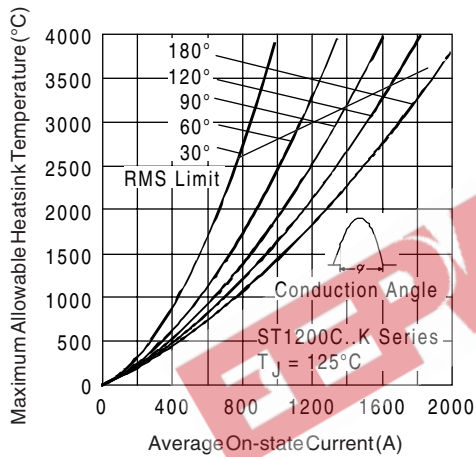


Fig. 5 - On-state Power Loss Characteristics

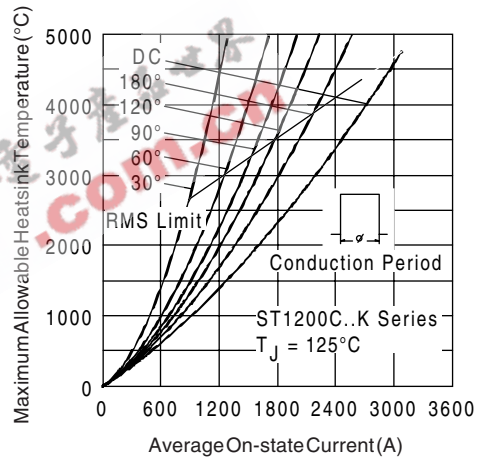


Fig. 6 - On-state Power Loss Characteristics

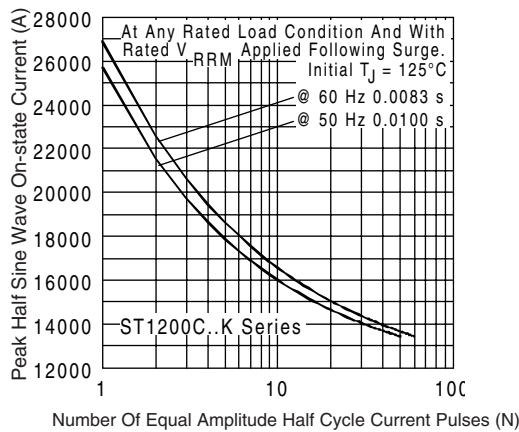


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

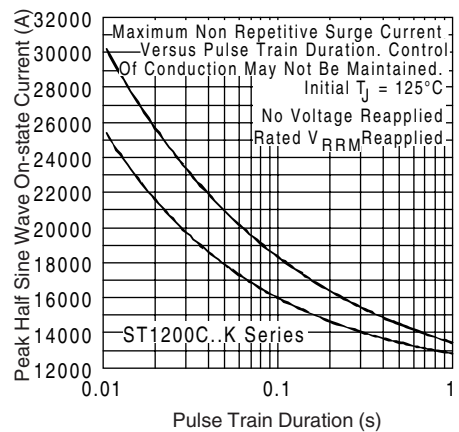


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

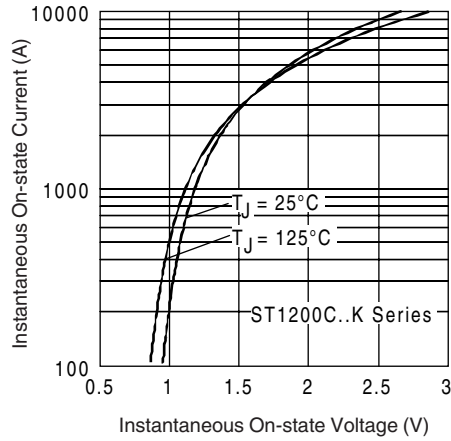


Fig. 9 - On-state Voltage Drop Characteristics

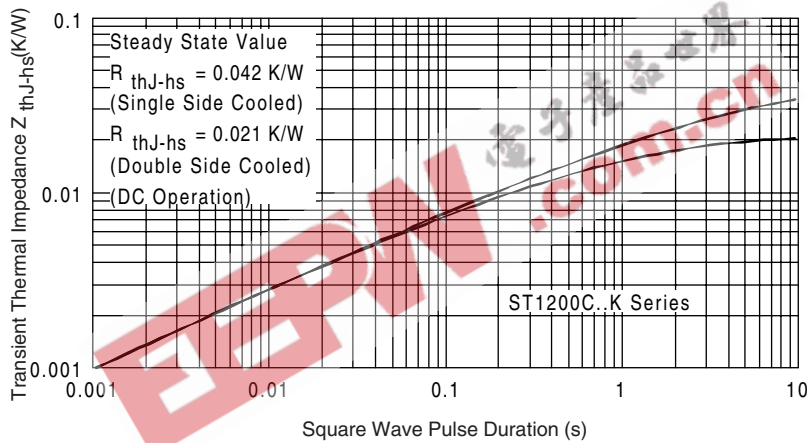


Fig. 10 - Thermal Impedance  $Z_{thJ-hs}$  Characteristics

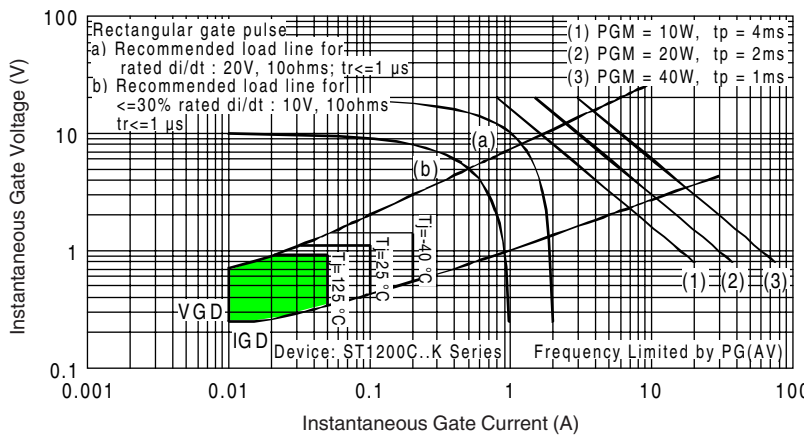


Fig. 11 - Gate Characteristics